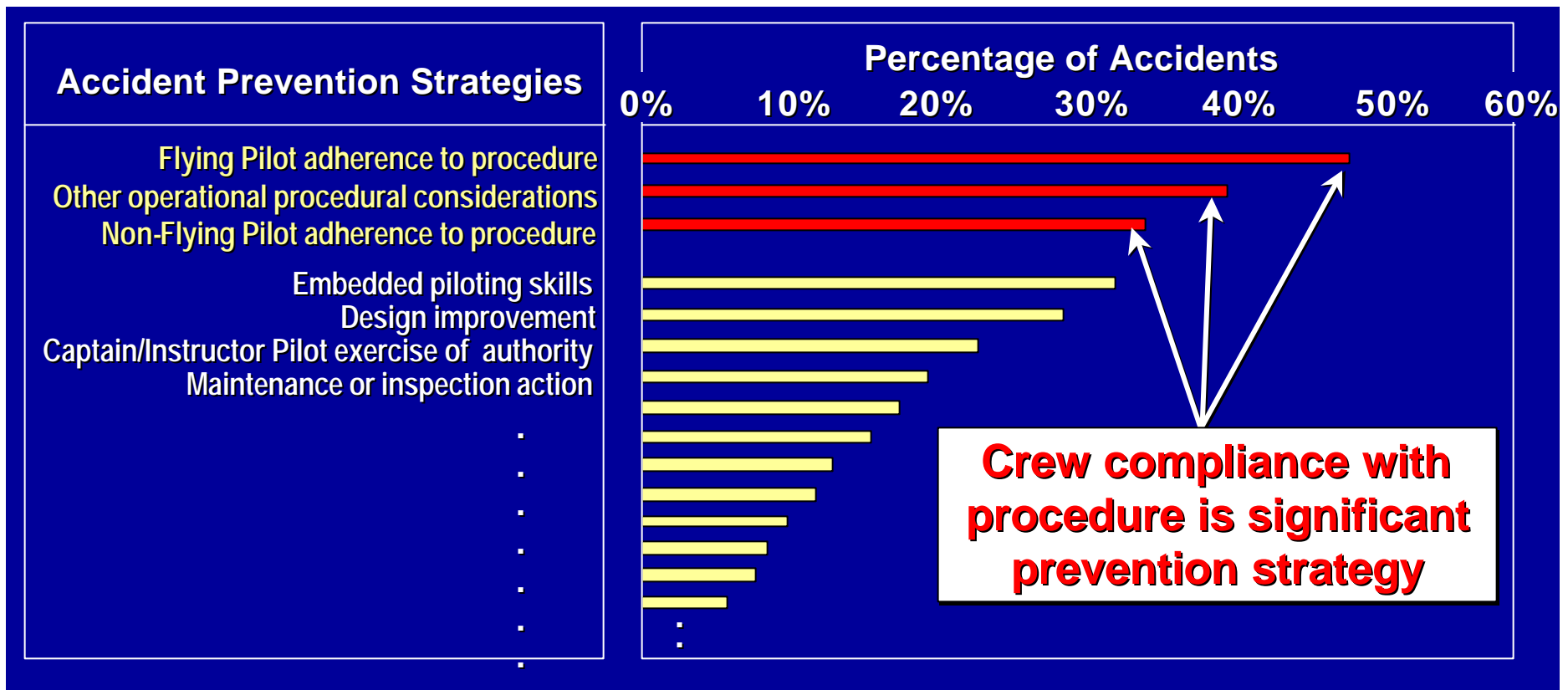# Analytical Methods and Tools

"Review of Procedural Event Analysis Tool (PEAT)"

Mr. Mike Moodi

PEAT Project Manager, Flight Technical Services

Boeing Commercial Airplanes

Multiple Accident Prevention Strategies

Accident Prevention Strategies

Percentage of Accidents

| 0% | 10% | 20% | 30% | 40% | 50% | 60% |

Flying Pilot adherence to procedure
Other operational procedural considerations
Non-Flying Pilot adherence to procedure

Embedded piloting skills
Design improvement
Captain/Instructor Pilot exercise of authority
Maintenance or inspection action

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Crew compliance with procedure is significant prevention strategy

Each bar represents the percentage of HULL LOSS accidents (1982-1991) which contained at least one instance of the listed Prevention Strategy.

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PEAT Characteristics
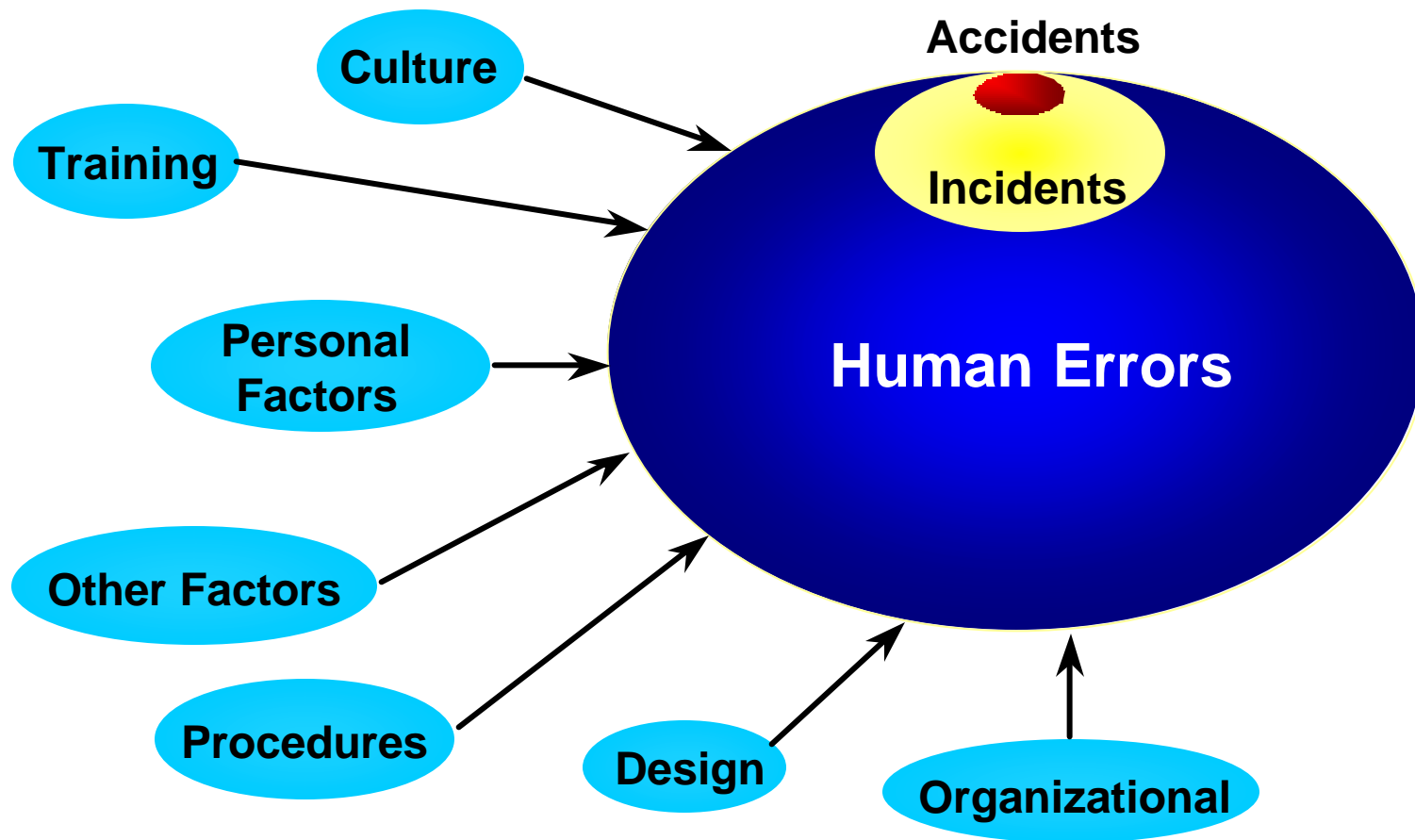
What is PEAT ?

Analytic, structured tool, specifically designed for investigation of flight crew (procedural) errors in serious events.

Purpose:

To provide airlines with a safety and risk management tool aimed at enhancing the reliability, consistency, and effectiveness of the investigation process.

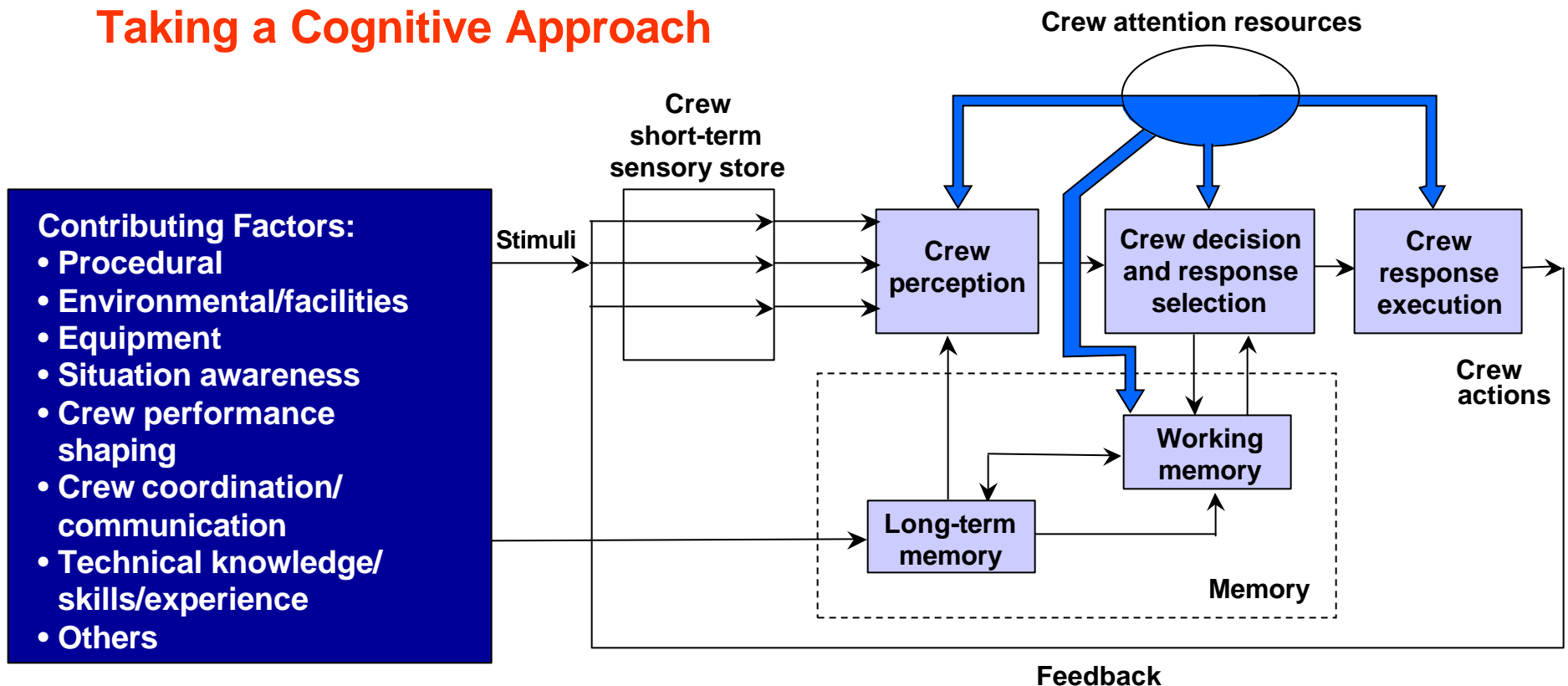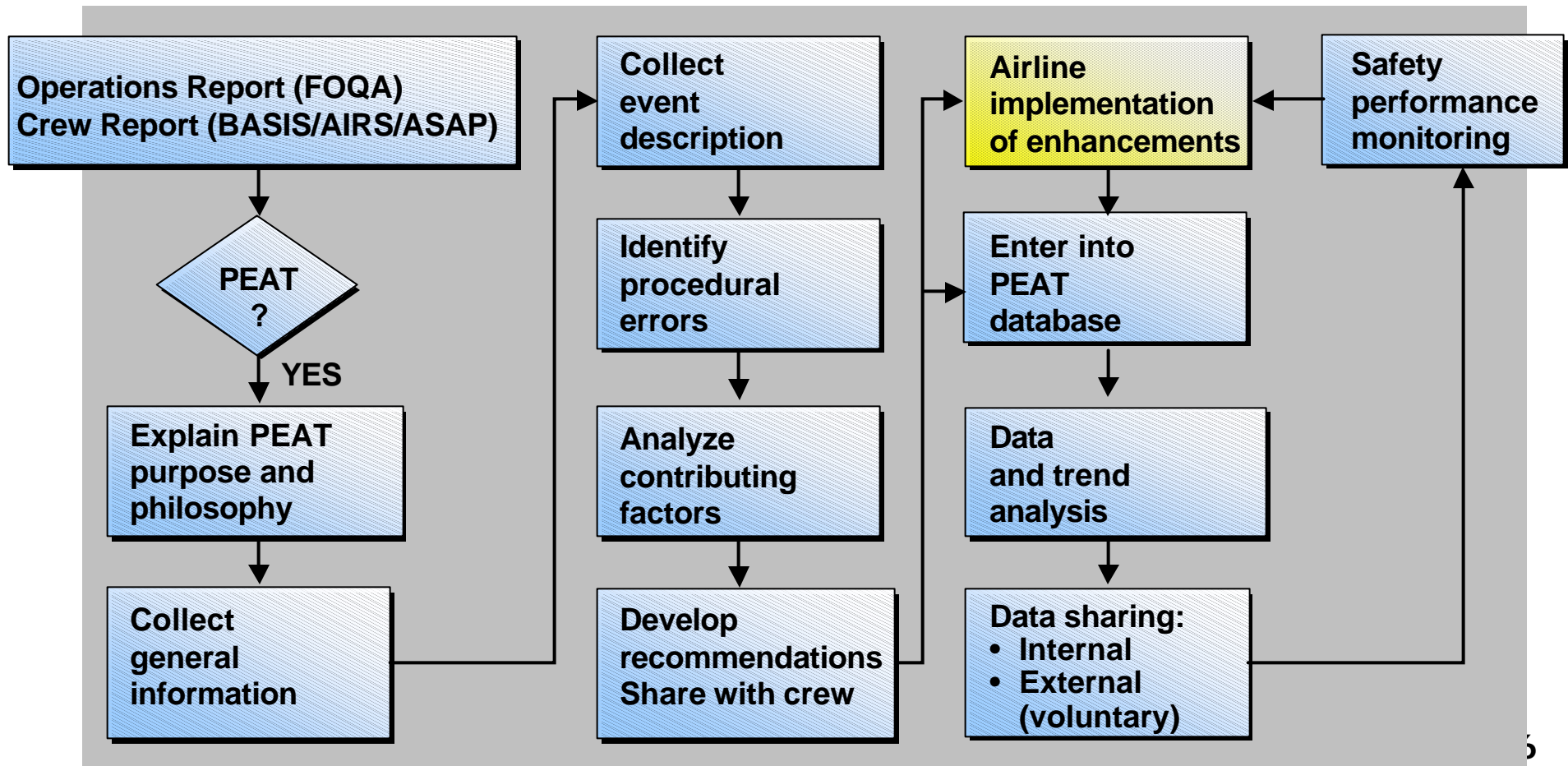# *Contributing Factors To Human Error*

Culture

Training

Personal Factors

Other Factors

Procedures

Design

Organizational

Accidents

Incidents

Human Errors

Source: FAA 1998

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Addressing the "Why" of Crew Decisions

Taking a Cognitive Approach

Crew attention resources

Crew short-term sensory store

Contributing Factors:
- **Procedural**
- **Environmental/facilities**
- **Equipment**
- **Situation awareness**
- **Crew performance shaping**
- **Crew coordination/ communication**
- **Technical knowledge/ skills/experience**
- **Others**

Stimuli

Crew perception

Crew decision and response selection

Crew response execution

Crew actions

Working memory

Long-term memory

Memory

Feedback

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PEAT Process

| Operations Report (FOQA) Crew Report (BASIS/AIRS/ASAP) |
| PEAT ? | — YES |
| Explain PEAT purpose and philosophy |
| Collect general information |

| Collect event description |
| Identify procedural errors |
| Analyze contributing factors |
| Develop recommendations Share with crew |

| Airline implementation of enhancements |
| Enter into PEAT database |
| Data and trend analysis |
| Data sharing: • Internal • External (voluntary) |

| Safety performance monitoring |

Current PEAT Application Functionality

- **Storing Event data**
  - **Crew error characteristics**
  - **Contributing factors**
  - **Recommendations**
- **Trending**
- **Graph and report generating**
- **Data de-ident and sharing**

PEAT Query Report Example

Contributing Factor

| Error Description	Factor
Hydraulics item on in-range checklist was omitted by nonflying pilot (PNF)	Procedural awareness
First officer did not set engine bleed air to "on" position while performing the climb checklist.	Procedure frequency of use
First officer did not understand tower's instructions to hold short at runway intersection	On-board distractions
PF descended through gllideslope	Piloting (control) skills
PF did not initiate procedure turn in timely manner	Geographic position awareness
PF failed to cross check altitude in MCP	Procedural awareness
PF failed to maintain path on glideslope.	Speed awareness
PF over-rotated on takeoff.	Airplane configuration awareness
PNF failed to make 1000 ft. call out for altitude level off.	In-flight crew fatigue
PNF incorrectly set altitude in mode control panel	Workload

How frequently does each Factor Type contribute to procedural deviations by Phase of Flight?

Contributing Factor Type

Flight Phase	Equipment Factors	Procedural Factors	Experience Factors	Communication Factors	Awareness Factors	Performance Factors	Environmental Factors	Grand Total
Taxi Out				1	1	4	3	9
Takeoff		2	7	1	2	6	1	19
Initial Climb		2	2	4	7	8		23
Climb	1	1	1	1	3	5	1	13
Descent		3		7	6	9	6	31
Initial App.	3	2	1	4	10	6	6	32
Final App.	2	2	1	1	6	3	1	16
Landing		1	1	1	2	2	2	9
Taxi-In					3	4	6	13
Grand Total	6	13	13	20	40	47	26	165

What is the distribution of the "Event that started the investigation" by visibility conditions?

PEAT Graph
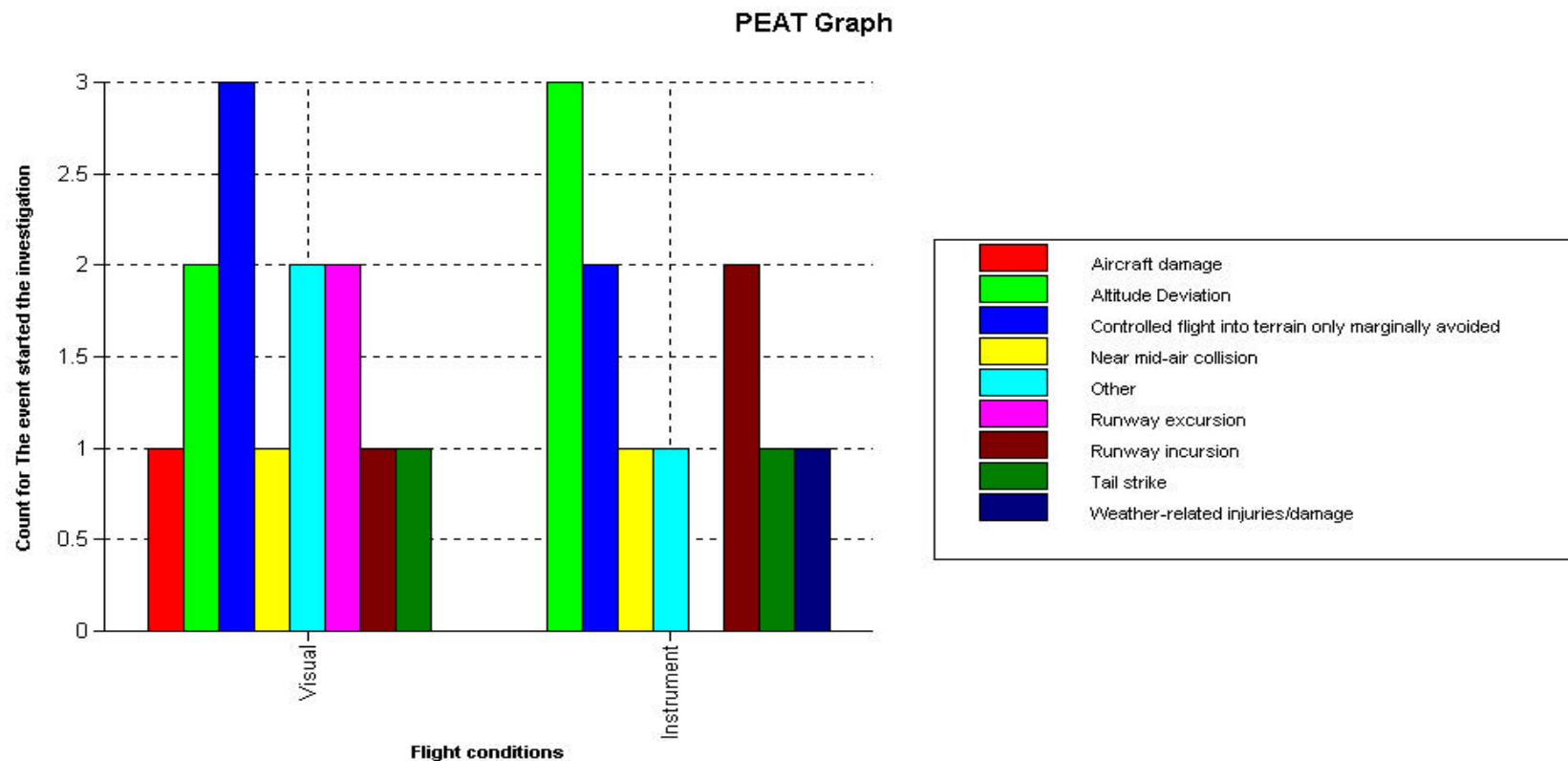
Tool developer's Interest in GAIN

- **Provide GAIN WG B with PEAT evaluation feedback from customer airlines.**

- **Support the data sharing concept by:**
  - **Incorporating the necessary features into the tool.**
  - **Promoting management culture changes aimed at establishing "Non-punitive" reporting.**

Operational Readiness Review Attributes

Initial Impressions

- **Usefulness:** "How helpful is tool to airline flight safety office?

  Continental: **91%** Developer Est.: **70%**

- **Usability:** "How easy is tool to use in terms of set-up, applying input data, generating results, and disseminating results?"

  Continental: **55%**   Developer Est.: **75%**

Future Plans For PEAT

- **Possible use of PEAT for investigation of minor operational events.**

- **Possible use by instructor for measure of simulator training effectiveness.**

- **Enhancement of the Risk Analysis/Assessment aspect of the tool.**

Closing Comments

- **Industry team feedback:**
  - **Provides in-depth, structured analytic process.**
  - **Provides consistency in application and results.**
  - **Focuses on key event elements and contributing factors.**
  - **Helps us better understand the reasons underlying procedural compliance errors.**
  - **Can use with other industry tools to develop effective remedial measures.**
  - **Significantly enhances management of risk and safety.**

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